Space Weather Technical Forecast

Issued on Thursday, 11 November 2021 at 00:15 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar Activity was at very low levels, with occasional low B-class activity. There are currently three sunspot regions visible, with AR2893 in the northwest and AR2894 in the southeast (both Hsx/Alpha) persisting as simple uni-polar spots. AR2895 (Dao/Beta), in the northeast, showed some growth in its main intermediate spot.

No Earth-directed CMEs were observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind speed, as measured by DSCOVR was slightly elevated between 400-450 km/s. Density values were generally average. Total IMF Bt was weak at mainly 3-5 nT, with an unremarkable north-south component Bz of +/- 5 nT. Phi angle was mainly positive (away from sun). Resultant geomagnetic activity was predominantly Quiet (Kp 1 to 2) with an Unsettled (Kp 3) interval at 10/0000-0300 UTC.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16, was initially slightly enhanced in response to the M-class flare on the 9th, but remained well below the S1 level. The high energy electron flux (greater than 2 MeV) was at moderate to background levels, peaking at 705 pfu at 10/1615 UTC. The 24-hour integrated fluence was initially just below the Active threshold, but has decrease increasingly quickly through the period. The observed value at 11/0000 UTC was 2.14e7 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be generally very low, with a chance of C-class flares.

Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs in the forecast. A weak CME is expected to pass ahead of Earth, with a weak glancing blow just possible, most likely on day 1 (11th). However, confidence is very low for this and any potential impacts expected to be minimal.

Solar wind speeds are near slow ambient levels, but some slight enhancements are possible through the period. These most likely from weak coronal hole effects from the small CH18/- later in the period. Geomagnetic activity is expected to be mostly Quiet with occasional Unsettled intervals, and just a low risk of isolated Active intervals, mainly from any possible weak coronal hole influence on day 3.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to be at or near background levels. The high energy electron flux (greater than 2 MeV) is expected to be at moderate to background levels, with a diminishing chance of reaching high levels during the diurnal peak. 24-hour electron fluence is expected to continue on a downward

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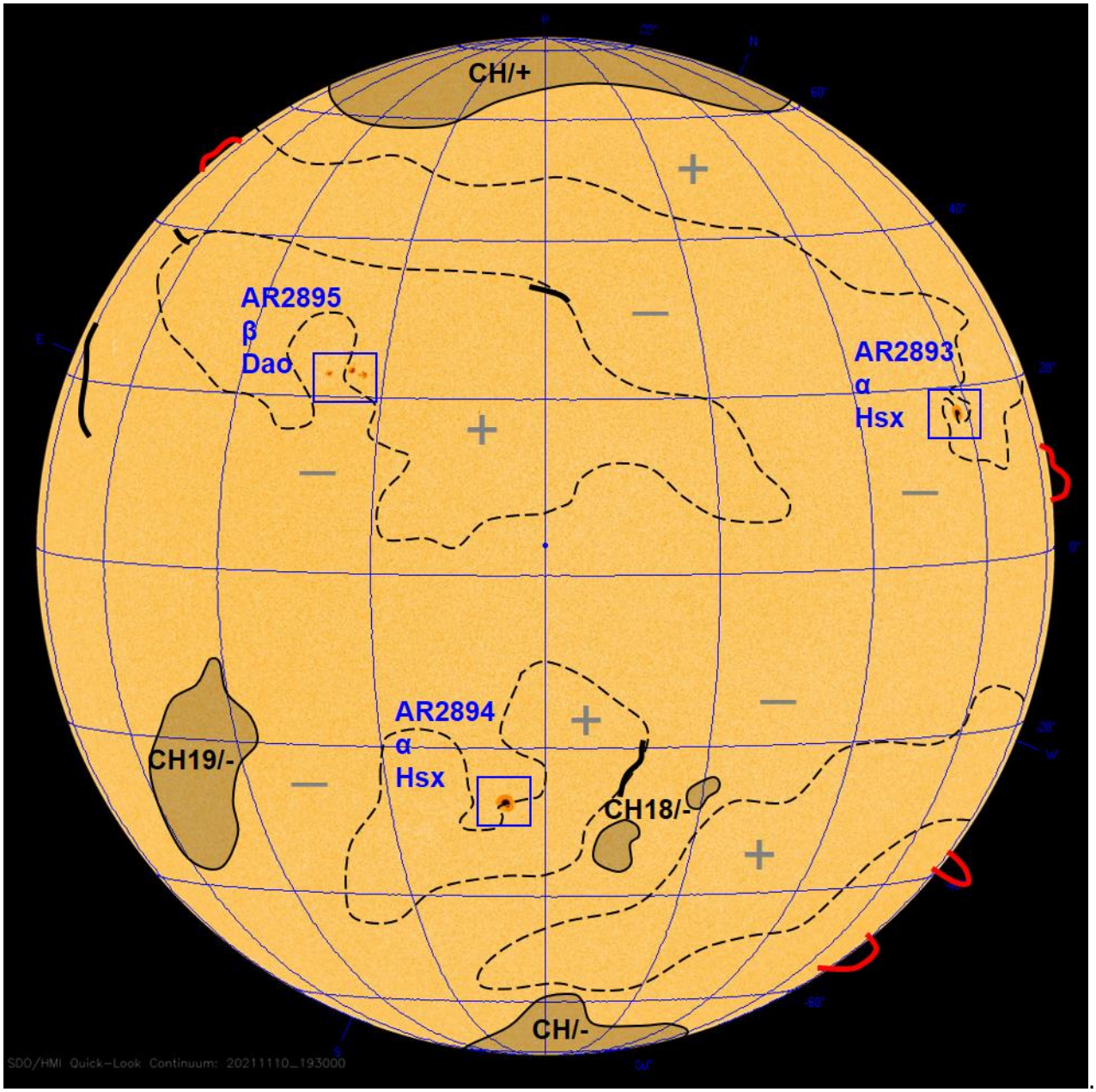
trend, below the Active (1e8 integrated pfu) threshold.

Figure 1. Solar Analysis Valid 10/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

There are no Earth-directed CMEs expected in the forecast. A weak CME is expected to pass ahead of Earth, with a weak glancing blow just possible, most likely on day 1 (11th). However, confidence is very low for this and any potential impacts expected to be minimal.
Solar wind speeds are near slow ambient levels, but some slight enhancements are possible through the period. These most likely from weak coronal hole effects from the small CH18/- later in the period.

Geomagnetic activity is expected to be mostly Quiet with occasional Unsettled intervals, and just a low risk of isolated Active intervals, mainly from any possible weak coronal hole influence on day 3.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
*	*	*	*	*	*	*

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Radio Blackouts - X-Ray Flares:

Generally Very low solar activity is expected, with a chance of C-class flares. There are currently three magnetically simple regions visible. Of these, AR2895 (Dao/Beta) in the northeast gives the greatest potential for any flare activity.

Current far side STEREO EUVI imagery would suggest no further significant active regions likely to move into view through the next few days.

X Ray Flares / Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	1	5	5	1
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

No solar radiation storms are expected. The high energy proton flux (greater than 10 MeV) at GOES-16 was initially still elevated (although well below S1/Minor Storm levels) in the wake of the M2 flare on 9th Nov. However, levels have continued to drop slowly and are now back close to background levels.

Radiation Storms / Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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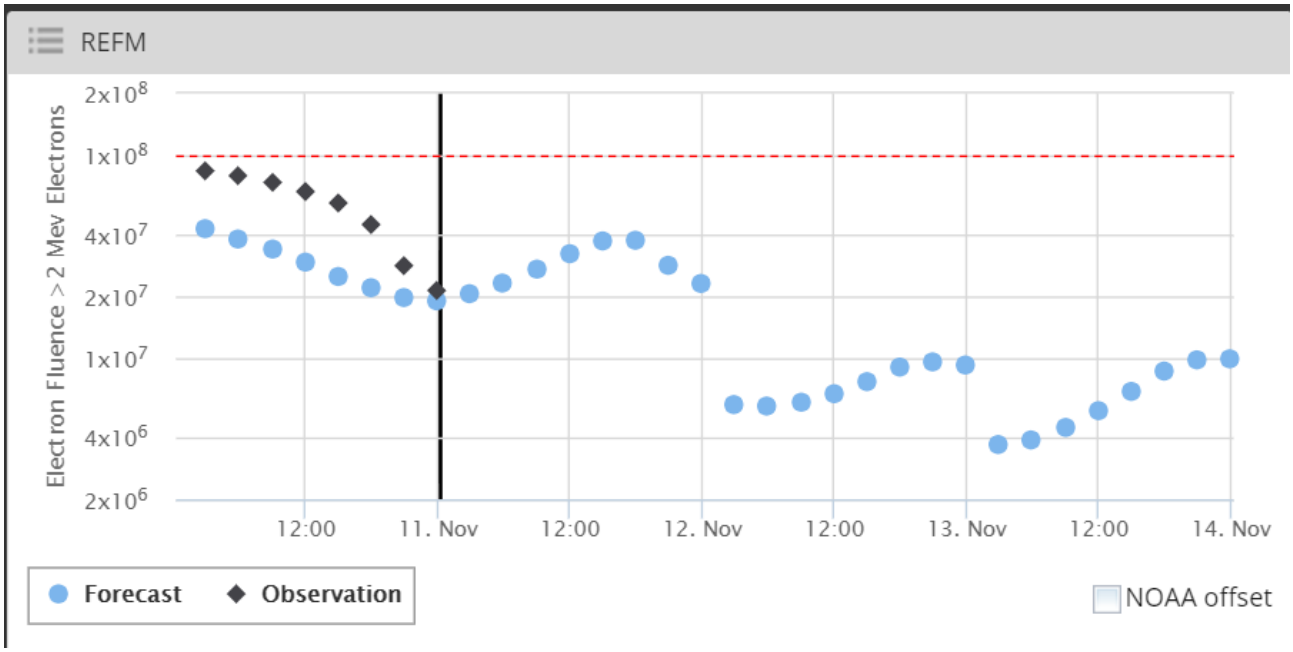
High Energy Electrons Event (≥ 2MeV):

High energy (greater than 2 MeV) electron flux at GEO is at moderate to background levels, and is likely to remain so in the coming days, with a diminishing chance of reaching high levels during the diurnal peak. Any possible weak coronal hole or CME effects are not expected to have a significant impact.

The associated 24-hour electron fluence is currently below the Active threshold, and is likely to see a continuing slow downward trend. The overall trend pattern of the REFM forecast data seems reasonable at present, with observations now close to model expectations.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	20	10	10	10
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 2: MOSWOC REFM observed and forecast electron fluence.



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